COMMENTARY

Infect Dis Clin Microbiol 2026; 8(2): 228–31

Shaping the Future of Vaccinology in a Post-Pandemic World: Insights from the Sixth ESCMID Conference on Vaccines

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Under typical circumstances, vaccine development and implementation timelines require at least a decade to progress sequentially through the stages of discovery research and preclinical development to clinical trials, vaccine regulatory approval, and deployment (1). However, the COVID-19 pandemic demonstrated that this timeline can be accelerated when global scientific effort, financial focus, and unprecedented international collaboration converge on a single priority (2). The pandemic reminded us of the persistent global threat posed by infectious diseases and the critical importance of vaccination as a cornerstone of public health preparedness.

Vaccination has fundamentally altered the course of human disease history, serving as a transformative intervention that drastically reduced the burden of infectious illnesses worldwide (3). Today, collaboration among healthcare professionals, researchers, industry partners, policymakers, and communities is more critical than ever to ensure sustained vaccine innovation, equitable access, and public trust. Recent shifts in the vaccination policies of some countries, where longstanding vaccine recommendation policies are being reconsidered, and well-established immunization programs are facing increasing scrutiny, illustrate how easily progress can be reversed. At the same time, anti-vaccine movements are expanding their influence, and public trust in vaccines

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Received: March 6, 2026
Accepted: March 25, 2026
Published: March 30, 2026

Suggested citation:
Özkaya-Şahin G, Ong DSY. Shaping the future of vaccinology in a post-pandemic world: Insights from the Sixth ESCMID Conference on vaccines. Infect Dis Clin Microbiol. 2026;8(2): 228–31.

DOI: 10.36519/idcm.2026.977

remains vulnerable in the aftermath of the pandemic (4). These shifts, often amplified by misinformation, threaten the control of vaccine-preventable diseases by reducing vaccination uptake, leading to increased disease incidence and undermining herd immunity (5).

The European Society of Clinical Microbiology and Infectious Diseases (ESCMID) has long recognized the vital role of vaccines in safeguarding global health. In this context, the Sixth ESCMID Conference on Vaccines took place from 10–13 September 2025 in Lisbon, Portugal, drawing remarkable interest from across the globe. A total of 53 distinguished speakers and 416 participants from 64 countries and six continents gathered to discuss the latest advances in vaccinology—figures that again highlight ESCMID's standing as a respected, influential, and trusted voice in global infectious diseases. The conference was prepared in close collaboration with strategic partners, reflecting ESCMID's commitment to interdisciplinary and multi-stakeholder engagement. The inclusion of the European Society for Paediatric Infectious Diseases (ESPID) in the scientific program committee ensured essential pediatric perspectives, while the European Association of Hospital Pharmacists (EAHP) contributed critical perspectives on hospital pharmacy practice. Participation by the European Medicines Agency (EMA) in the program committee further enriched the program by incorporating European regulatory, safety-monitoring, and vaccine policy dimensions into the scientific dialogue. Presentations from international organizations such as the World Health Organization (WHO), the European Centre for Disease Prevention and Control (ECDC), the Coalition for Epidemic Preparedness Innovations (CEPI), and the Gates Foundation broadened the scope and relevance of the program beyond academia.

As reflected in its title, "From Development to Real-World Clinical Practice & Global Health", the conference embraced a broad and truly multidisciplinary exploration of vaccines. Cutting-edge pre-clinical research, next-generation vaccine platforms, clinical implementation, real-world evidence, and global public health strategies were presented and debated by leading experts in the field. These themes were examined through complementary system-based (e.g., respiratory, gastrointestinal), pathogen-focused (e.g., bacterial, viral, parasitic), and population-oriented (e.g., pediatric, geriatric, immunocompromised) lenses—offering participants a comprehensive, integrated, and multi-layered understanding of the current and future landscape of vaccinology.

A diverse range of session formats was employed to sustain attendee engagement throughout the conference, including keynote lectures, symposia, meet-the-expert sessions, panel discussions, flash (elevator-pitch) presentations, and poster sessions. These formats received consistently positive evaluations from participants. Across scientific sessions, scheduled breaks, and networking events, researchers, epidemiologists, clinicians, industry partners, and policymakers exchanged insights, identified opportunities for collaboration, and strengthened international networks.

The conference opened with dedicated sessions designed to equip early-career colleagues with a solid grounding in vaccine platforms and immune mechanisms. Over the following four days, participants were guided through state-of-the-art developments in vaccines targeting a broad spectrum of pathogens. Bacterial vaccines were covered in depth, including those against *Bordetella pertussis*, *Borrelia burgdorferi*, *Chlamydia* spp., *Escherichia coli*, *Mycobacterium tuberculosis*, *Neisseria gonorrhoeae*, *Neisseria meningitidis*, *Salmonella enterica* serovar Typhi and nontyphoidal strains, *Streptococcus pneumoniae*, hemolytic streptococci, and *Treponema pallidum*.

Equally extensive were the sessions addressing viral vaccines, spanning pathogens of both longstanding and emerging global concern: chikungunya virus, Crimean-Congo hemorrhagic fever virus, cytomegalovirus, dengue virus, hepatitis viruses, human immunodeficiency virus, human metapneumovirus, human papillomavirus, human T-lymphotropic virus, influenza virus, measles virus, poliovirus, rabies virus, respiratory syncytial virus, rotavirus, severe acute respiratory syndrome coronavirus 2, tick-borne encephalitis virus, and Zika virus.

Parasitic diseases—which continue to impose a significant global burden—were also featured, with updates on vaccine development for leishmaniasis, malaria, and schistosomiasis.

Alongside pathogen-specific advances, the conference highlighted several important themes shaping the future of vaccinology: breakthroughs in emerging technologies, the integration of artificial intelligence (AI) in vaccine design and evaluation, evolving regulatory pathways, and the ethical considerations shaping vaccine research. Sessions also tackled some of the most pressing societal challenges—vaccine hesitancy, the spread of misinformation, and strategies for communicating evidence-based information effectively to the public. Each of these themes was explored in depth and followed by dynamic discussion among the conference participants.

ESCMID held its inaugural vaccine conference in Prague, Czech Republic, in 2011—an event that quickly established a strong scientific identity and received enthusiastic support from the infectious diseases community. Recognizing both the momentum generated and its broader responsibility to global public health, ESCMID committed to convening this conference biennially. The fifth edition took place in September 2019 in Bilbao, Spain, just months before the emergence of COVID-19 fundamentally reshaped the world. The pandemic forced an unexpected six-year interruption in this important series. Yet, the intervening years were anything but static: vaccine science advanced at unprecedented speed, new technologies redefined what is possible, and public attitudes towards vaccination became both more complex and more consequential. Against this backdrop, the relaunch of the ESCMID Vaccine Conference in September 2025 stands as a pivotal milestone. It marks not only the return of a vital scientific forum but also a renewed commitment to strengthening the voice of researchers, fostering evidence-based policy, and restoring public trust through transparent, accurate communication.

The conference delivered several overarching messages and forward-looking conclusions:

Vaccination is a lifelong investment in health. Immunization enhances quality of life and extends life expectancy from infancy through old age, underscoring the need to prioritize adult immunization alongside pediatric vaccination programs.

Vaccines are a cornerstone in the fight against antimicrobial resistance. By preventing infections and reducing the need for antibiotic treatment, vaccination indirectly but powerfully contributes to curbing the global rise of antimicrobial resistance.

Preparing for the next pandemic requires strategic innovation. Advancing vaccine technologies must remain a top priority, complemented by strengthened regulatory frameworks for *in vitro* evaluation, thoughtful integration of AI into vaccine development, attention to ethical dimensions, and proactive, well-informed engagement with policymakers.

A global health approach is needed. To achieve equity, strengthening global vaccine supply chains is crucial. Sustained funding combined with international collaboration is required to overcome developmental roadblocks.

Combating vaccine hesitancy and misinformation demands sustained, evidence-based action. Effective communication strategies—leveraging social media, as well as visual and print media—are essential for delivering accurate information and maintaining public trust.

Ethical Approval: N.A.

Informed Consent: N.A.

Peer-review: Externally peer-reviewed

Author Contributions: Concept – G.Ö.Ş., D.S.Y.O.; Design – G.Ö.Ş., D.S.Y.O.; Supervision – G.Ö.Ş.; Analysis and/or Interpretation – G.Ö.Ş., D.S.Y.O.; Literature Review – G.Ö.Ş., D.S.Y.O.; Writer – G.Ö.Ş., D.S.Y.O.; Critical Reviews – G.Ö.Ş.

Conflict of Interest: The authors declare no conflict of interest.

Financial Disclosure: The authors declared that this study has received no financial support.

AI Statement: The authors confirm that no artificial intelligence (AI) tools were used in the preparation, analysis, or writing of this manuscript.

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